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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/826,851	04/06/2001	Toshiaki Kuniyasu	Q63956	3185

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SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, DC 20037-3213

EXAMINER

MENEFEE, JAMES A

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 03/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/826,851

Applicant(s)

KUNIYASU ET AL.

Examiner

James A. Menefee

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 18-21 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-7, 18-21 and 23 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.



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Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 2828

DETAILED ACTION

Response to Amendment

In response to the amendment filed 31 January 2003, claims 8-17 are cancelled, claims 1, 7, and 20 are amended, and claim 23 added. Claims 1-7, 18-21, and 23 are pending.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 3 discusses two concave portions that are each filled with a metal, however there is nothing to distinguish between the two metals. The second metal should be referred to as "another metal", or some other manner that serves to distinguish. Further, in claim 5 the claim refers to a heat sink connected to "the metal". As the claim in one embodiment depends on claim 3, it is not clear which metal the heat sink should be connected to.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2828

Claims 1, 6-7, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kizuki (previously cited US 5,608,749).

Regarding claims 1 and 23, Kizuki discloses a semiconductor laser element comprising a substrate, a plurality of semiconductor layers 2-6 formed on the substrate, and a concave portion 8 formed on a surface of the substrate 1 opposite the side having the semiconductor layers 2-6 formed thereon, the concave portion 8 is filled with a metal having a heat conductivity higher than the substrate 1.

Regarding claim 6, a plurality of light-emitting portions are formed to form a laser array (Fig. 16).

Regarding claim 7, this claim is only reciting limitations drawn to the intended use of the device. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Claims 1, 5, 7, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujihara et al. (previously cited US 6,108,361).

Regarding claims 1 and 23, Fujihara discloses in Fig. 6D a semiconductor laser element comprising a substrate 501, a plurality of semiconductor layers 502+ formed on the substrate, and a concave portion 521 formed on a surface of the substrate 501 opposite the side having the semiconductor layers 502+ formed thereon, the concave portion 521 is filled with a metal having a heat conductivity higher than the substrate 521.

Regarding claim 5, contact block 527 acts as a heat sink and is connected to the metal filled in the concave section (Fig. 7).

Regarding claim 7, this claim is only reciting limitations drawn to the intended use of the device. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Regarding claims 1 and 23, Kizuki and Fujihara do not disclose that the concave portion has a depth extending at least through the thickness of the substrate. However, the Examiner contends that the purpose of the concave portion in each reference is to provide heat dissipation of the layers located on the substrate, and thus it would have been advantageous to locate the concave portion as close to these layers as possible. Kizuki even states that the distance from the active layer to the edge of the concave portion be as small as possible (col. 2 last paragraph). Thus, it would have been an obvious change in shape to increase the depth of the concave portion so that it extends through the entire substrate. Further, it is well known that a concave portion in a substrate may extend at least through the thickness of the substrate. See for example the Kawai reference used below.

Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. (previously cited US 6,281,524) in view of Fujihara. Yamamoto discloses the claimed invention as follows:

Art Unit: 2828

Regarding claim 2, Yamamoto discloses a semiconductor laser element having a substrate 201, a plurality of semiconductor layers 202+ disposed on the substrate 201, and a concave portion formed on a part of the semiconductor layers 202+ on the side furthest from the substrate 201 (Fig. 19). It is not disclosed that the concave portion is filled with a metal having higher heat conductivity than the semiconductor layer. Yamamoto does teach that the laser device is connected to a heat sink at the groove. Fujihara teaches that a laser device connected to a heat sink at a groove should have a metal having a higher heat conductivity than the surrounding portion fill the groove. It would have been obvious to one skilled in the art that the concave portion should be filled with a metal having a higher heat conductivity than the semiconductor layer, as this will provide a high heat release, as taught by Fujihara.

Regarding claim 3, the device is taught as in the rejection of claim 2 above, except there is further not taught that the substrate has a concave groove filled with a metal as in claim 1. Fujihara teaches this limitation as in the rejection of claim 1 above. It would have been obvious to one skilled in the art to include this metal filled groove in the substrate because it provides for improved heat release, as taught by Fujihara.

Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai. (previously cited US 6,239,033). Kawai discloses a device comprising a substrate 51, a semiconductor layer 52-59 including an active layer 56 and formed on the substrate 51, and one of a pair of electrodes 60,62 is formed on each of the substrate 51 and the semiconductor layer 52-59. There is inherently a current injection region because the device is electrically pumped. There is a groove 61 formed on the substrate on the side furthest from the semiconductor layer,

Art Unit: 2828

said groove 61 reaching the depth of the semiconductor layer 52-59. The electrode 62 is formed on the surface of the groove 61. Kawai does not disclose that the structure is made of the materials as claimed. However, parts of a laser device are often made of the materials as claimed. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the substrate of GaN and the semiconductor layer with a GaN base, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai as applied to claims 18-19 above, and further in view of Fujihara. Kawai teaches the limitations of claims 18-19 as shown above, but does not teach that the groove is filled with a metal, specifically gold, where the surface of the groove is flattened and a heat sink is formed thereon. Fujihara teaches a substrate to a laser device that contains a concave groove thereon that is filled with gold and is flat. A heat sink is connected through the groove to the substrate of the laser device (see Fig. 7). It would have been obvious to one skilled in the art to connect the laser device to a heat sink so that heat release is improved, thus suppressing output saturation, as taught by Fujihara.

Allowable Subject Matter

Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and

Art Unit: 2828

any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

It is not taught or disclosed as in claim 4 that the concave portion has a reverse mesa form. While this claim was previously rejected as being an obvious change in shape, the arguments have persuaded the Examiner that this change in shape is critical and offers an unexpected advantage, and thus the change in shape is no longer deemed obvious.

Response to Arguments

Applicant's arguments, see page 5 of the response filed 31 January 2003, with respect to claim 4 have been fully considered and are persuasive. The rejection of claim 4 has been withdrawn.

Applicant's arguments with respect to the remaining claims are not persuasive. Applicant made the following arguments:

1. Argument against rejection of claim 1. (p. 3 of response)
2. Argument against rejection of claim 7. (p. 3)
3. Argument against rejection of claim 2, particularly:
 - a. "Yamamoto does not disclose or suggest that groove 208...is concave...In fact, the drawing depicts groove 208 as being convex." (p. 4)
 - b. "There is nothing in the disclosures of either Yamamoto or Fujihara that would suggest to one skilled in the art to combine them." (p. 4)
4. Argument against rejection of claim 18. (p. 6)

Art Unit: 2828

Regarding argument 1, the argument is moot in light of the new rejections above.

Regarding argument 2, the argument is not persuasive. Regardless of the elimination of the words “used as”, the claim still constitutes an intended use of the device, i.e. the device is used for optically pumping another device. Still, even if one were to assume that the claim did not constitute an intended use, it is extremely obvious to one skilled in the art to use a semiconductor laser to pump another laser, as the entire US classification subclass 372/75 is drawn to this.

Regarding argument 3a, the argument is simply wrong. The Examiner fails to see how this groove can be seen as convex. It is clearly concave. Merriam-Webster’s Dictionary defines concave – hollowed or rounded inward like the inside of a bowl.

Regarding argument 3b, the applicant argues that since each reference is fully functional, and neither suggests forming a groove in the layer shown in the other reference, then there is no reason to combine. This argument is traversed. Firstly, it does not matter that the references are fully functional. Nearly all patents disclose fully functional devices, so any combination of patents will include two fully functional references. Secondly, it does not matter that neither suggests forming a groove in the layer shown in the other reference. If one reference suggested making a groove in both layers, then the other reference would not be needed. The second reference is used in order to provide this suggestion. It is believed that sufficient advantage is achieved by the combination, as shown in the rejections, and thus there is a sufficient motivation to combine.

Regarding argument 4, the Applicant argues that Kawai teaches away from changing the substrate from sapphire to GaN because the sapphire is conducive to growth of GaN

Art Unit: 2828

semiconductors. However, Kawai is referring to sapphire with respect to other substrates, such as GaAs and SiC. There is no mention that sapphire should be used rather than a GaN substrate.

Examiner contends that the reasoning used by the Applicant for Kawai's preference to sapphire, i.e. that the substrate is conducive to growth of GaN semiconductors, would be irrelevant in this case because a GaN substrate will also be conducive to growth of GaN semiconductors.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Menefee whose telephone number is (703) 605-4367. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Ip can be reached on (703) 308-3098. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JM
February 27, 2003


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